



About Stem

Founded: 2009

Operations: California, New York and Hawaii

Major Experience with Value Streams / Policies:

- Demand Charge Management
- Southern California Edison Local Capacity RFO
- CA ISO aggregated storage in wholesale markets (Proxy DR)
- HECO local “auto-DR-like” program

100 Rollins

ANGELENO
GROUP

RWE



Constellation

An Exelon Company



MITSUI & CO.



stem

PG&E IRM 2 / Supply Side Pilot

IRM 2 started mid-2014

- 6 sites for 100 KW resource
- Monthly capacity payment
- Energy payment as awarded

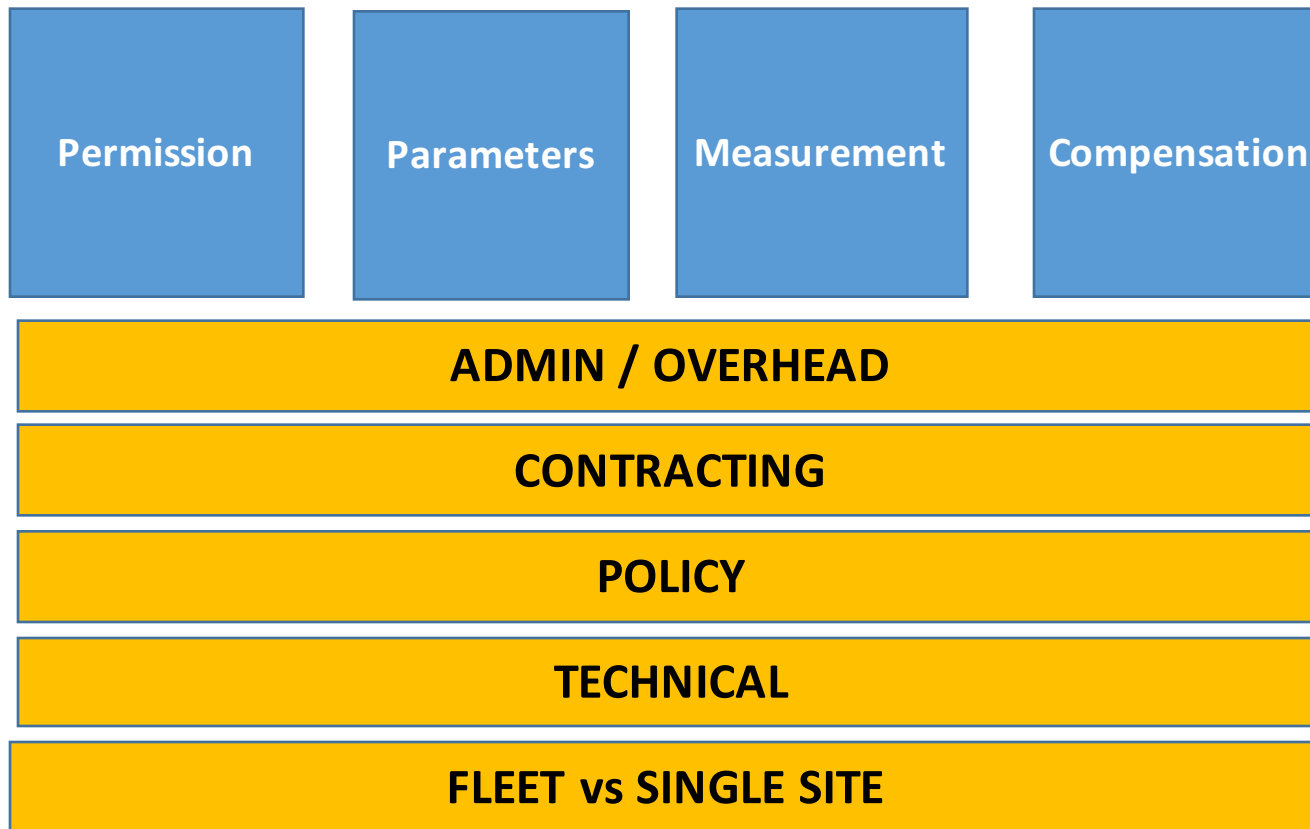
Currently operating in SSP

- Daily bidding
- 100% award performance
- Working on payment structure modifications to incentive higher market participation

MUA Use Case #3

- Demand Charge Management
- CAISO Proxy Demand Response Resource
- Initially, Day Ahead Energy Market
- August 2015 – Real time market

MUA Framework: Issue Categorization



Permission

Remove unnecessary rules explicitly preventing multi-use

- Contracts and PDR rules sometimes explicitly exclude other value streams
- Overlap issues should be resolved at measurement and settlement level, not at the program rules or contract level
- Example: PDR and Utility DR program participation are mutually exclusive
 - If 100% overlap then exclusion may be warranted
 - Rules and contract should not specify particular Programs as excluded but instead specify services
- Current rules:
 - SCE LCR customers cannot also enroll in BIP
 - PDR participants cannot do Freq Regulation or “DR Up”

Parameters

Market participation rules can make it infeasible to access other value streams

- Examples:
 - CAISO NGR's are required to be in market 24/7
 - Use Limits such as state of charge
- Fleet vs Single Site
 - Market participation rules often designed around individual sites as the resource rather than the capabilities of a fleet
- Unnecessary rules create additional risk
 - 100 KW commitment does not equal 100 KW of buildout

Measurement

Measure each value stream distinctly and directly

- Traditional 10-in-10 baseline is a derived measurement
- Baseline risk increased performance risk, requiring overbuild
- Example: 10-in-10 conflicts with other resources and value streams
 - Demand charge management
 - Solar
 - Other load control measures
- MGO Baseline is a good first step
 - Direct output metering makes more sense for storage
 - Current version does not account for storage charging
 - Fleet vs single site: can sites be swapped in and out dynamically?

#1 Highest Priority MUA issue: Finalize rules for MGO meter

Compensation

Assets should be compensated for distinguishable, incremental value provided to each market – including value being provided simultaneously to multiple markets

Examples:

- Demand charge management and PDR: energy component overlap – lag time
- Energy arbitrage and voltage support

Once the other categories of issues are resolved for a particular MUA – the business becomes an economic value/risk optimization challenge.

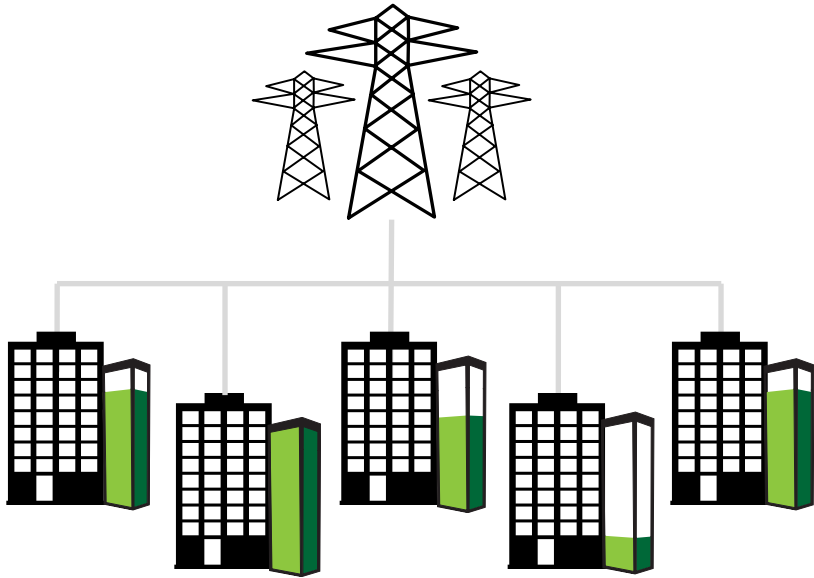
Storage is ultimately a software business: what is the most economical action for the asset to execute in any given moment.

Admin / Overhead

Unnecessary / legacy overhead causes friction, increasing costs and risk

- PDR has considerable overhead
 - Register as DRP with utility and CAISO
 - Paperwork associated with registering individual sites in and out of aggregation (SSP fleet change example)
- Metering
 - DERP and PDR moving in right direction with abstraction
- Settlement
- Fleet vs Single Site

Multi-Use Applications Principles



- Policies should enable as many value streams as physically and economically possible
- Policies should seek to lower risks in multi-use. Lower risk = reduced overbuild
- Added revenue – added overhead > added hardware
- Rules for multi-use of fleets are different than rules for single-sites

Stem Market Participation Evolution

